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The R&S®FS-K7 firmware option for the R&S®FSP, FSU and FSQ [*] families of spectrum and signal analyzers

enables you to measure analog modulation types such as AM, FM and ϕ M.

In addition to being able to measure modulation depth or frequency deviation, the latest version of this demodulator also measures modulation distortion such as SINAD or THD.

It even performs frequency-selective measurements of modulation

harmonics and measures frequency or phase settling.

Spectrum and Signal Analyzers R&S®FSP / FSU / FSQ

Extended measurement functions for analog modulation analysis

AF analysis with the AM/FM / ϕ M Measurement Demodulator R&S®FS-K7

The trend in communications has long been toward digital transmission methods. Yet many applications such as broadcast transmission or radiotelephony still make use of traditional analog transmission with AM or FM. To determine the modulation quality of an analog-modulated signal source, the distortion of the modulation signal is of interest in addition to measuring the modulation depth for AM or the frequency deviation for FM.

By offering the R&S®FS-K7 measurement demodulator option, Rohde & Schwarz long ago made it possible to analyze analog-modulated signals in a spectrum analyzer. The measurement demodulator is based on digital processing of the

sampled IF signal and allows comprehensive measurements of AM, FM and ϕ M signals. The latest firmware version of this measurement demodulator provides extensive function expansions.

With its new and sophisticated AF analysis function, the AM / FM / ϕ M Measurement Demodulator R&S®FS-K7 also offers **frequency-selective measurements in the modulation domain**.

These measurements are especially of interest with signals that are simultaneously modulated with several AF signals (e.g. stereo broadcasting or subcarrier modulation). While a conventional modulation analyzer only measures the sum of all modulations, an additional AF analyzer enables you to separate individual signals and to measure individual modulation depths. However, this AF analyzer must first be calibrated with a known modulated signal. The inte-

grated AF analyzer in the R&S®FS-K7 option is based on an FFT of the demodulated input signal and enables you to measure frequency-selective modulation depth and distortion. This eliminates any need for an additional AF analyzer and elaborate calibration, even in the case of sophisticated modulation analysis. The result of the FFT is displayed as an AF spectrum. Modulation results can directly be read by using the marker and delta marker. Based on the measured AF spectrum, measurement routines determine the total harmonic distortion (THD) and signal to noise and distortion (SINAD) (FIG 1). Tuning to the fundamental frequency is performed automatically. The bandwidth of the AF analyzer can be set as desired. It is limited only by the maximum possible AF bandwidth

(5 MHz in the R&S®FSP / FSU; 14 MHz in the R&S®FSQ). Various highpass and lowpass filters as well as deemphasis are available for filtering the demodulated signal.

A further typical application of a demodulator is to **measure settling on oscillators**. Frequency hopping methods require a specific frequency or phase accuracy after the settling time has elapsed. Previously, this measurement was expensive and effort-consuming and required several instruments. With the AM / FM / ϕ M Measurement Demodulator R&S®FS-K7, you can perform highly accurate frequency or phase settling measurements in a single unit (FIG 2). The large bandwidth of the demodulator (in the R&S®FSQ up

to 120 MHz) allows measurements with very high time resolution. The sampling rate is up to 256 Msample/s (time resolution \approx 4 ns). The settling measurement is triggered either by an external signal or in response to the demodulated signal (frequency, phase or level).

All new functions can be added to an existing instrument simply by upgrading the firmware.

Kay-Uwe Sander

For further articles regarding the Signal Analyzers R&S®FSQ, see pages 26, 28 and 31.

Condensed data of the R&S®FS-K7 with the R&S®FSP and R&S®FSU (values in parentheses apply to the R&S®FSQ)

Demodulation bandwidth (-3 dB)	100 Hz to 10 MHz (28 MHz, 120 MHz with the R&S®FSQ-B72 option)
AF frequency range	DC to 5 MHz (14 MHz)
Frequency deviation	max. 5 MHz (14 MHz)
Amplitude modulation depth	0% to 100%
Measurement uncertainty	3%
Measurement range THD, SINAD	0 dB to 80 dB

More information and data sheet at www.rohde-schwarz.com (search term: FS-K7)

REFERENCES

[*] Spectrum and signal analyzers for every requirement – an overview. News from Rohde & Schwarz (2004) No. 182, pp 30–36

FIG 1 AF spectrum display with THD and SINAD measurement.

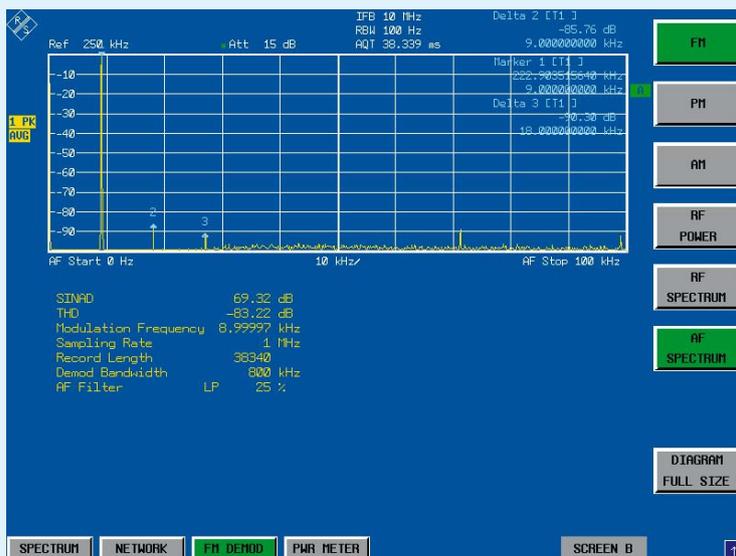


FIG 2 Frequency settling measurements on a synthesizer.

